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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/963,485	09/27/2001	Norihiko Sekine	011292	9317

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EXAMINER

KANG, DONGHEE

ART UNIT PAPER NUMBER

2811

DATE MAILED: 04/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/963,485	<b>Applicant(s)</b> SEKINE, NORIHIKO	
	<b>Examiner</b> Donghee Kang	<b>Art Unit</b> 2811	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 7-13 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20 is/are allowed.
- 6) ☒ Claim(s) 1-6, 14, 15 and 19 is/are rejected.
- 7) ☒ Claim(s) 16-18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 26, 2004 has been entered.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims **14-15** are rejected under 35 U.S.C. 102(b) as being anticipated by Itaya et al. (US 5,780,873).

Re claim **14**, Itaya et al. teach a semiconductor device comprising (Fig.6):

a first (117-111) and second (118) semiconductor substrates, both being different in lattice constant and bonded with each other (Col.12, lines 9-10), wherein an amorphous layer (119) made of constituent atoms of said first and second semiconductor substrates (Col.12, lines 7-9) and formed at an interface between said first and second semiconductor substrates. See also Col.10, lines 43-Col.12, line 29.

Itaya et al. do not explicitly teach the amorphous layer has a linear current-voltage characteristic. However, this feature is inherent in Itaya's device because the structure of Itaya is identical with the claimed structure.

Regarding claim **15**, Itaya et al. teach said first and second semiconductor substrate including a light-emitting layer (113; Col.10, lines 50-51).

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims **1-6 & 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Itaya et al. (US 5,780,873) in view of Piprek et al. ("Abrupt self-switching in fused GaAs/InP vertical-cavity lasers", CELO'99, pp. 458).

Re claims **1 & 3**, Itaya et al. teach a semiconductor device comprising (Fig.6):

a first semiconductor substrate (GaN-based light-emitting device structure section, 117-111); a second semiconductor substrate (GaAs, 118), both being different in lattice constant, and bonded with each other, (Col.12, lines 9-10); and an amorphous layer (119) made of constituent atoms of said first and second semiconductor substrates (Col.12, lines 7-9) and formed at an interface between said first and second semiconductor substrates. See also Col.10, lines 43-Col.12, line 29.

Itaya et al. do not teach the first semiconductor substrate being an InP substrate.

Long-wavelength lasers are very attractive owing to their application in optical communication systems and InP-based semiconductor material is conventionally used as an active layer in vertical-cavity surface emitting lasers to obtain long emission wavelength. Piprek et al. teach forming vertical-cavity lasers with long emission wavelength using InP-based light emitting structure on GaAs substrate (See Fig.2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute GaN-based light emitting structure in Itaya's device with InP-based light emitting structure as taught by Piprek to make a long wavelength laser, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as matter of obvious design choice. In re Leshin, 125 USPQ 416.

Re claim 2, Itaya et al. teach said first and second semiconductor substrates including a light-emitting layer (113; Col.10, lines 50-51).

Re claim 4, Itaya et al. do not teach the first semiconductor substrate including a compound semiconductor layer made of InGaAsP. InGaAsP is conventionally used as an active layer in InP based light emitting structure and also Piprek et al. teach InGaAsP MQW between InP cladding layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the active layer using InGaAsP MQW in InP-based light emitting structure, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as matter of obvious design choice. In re Leshin, 125 USPQ 416.

Re claim **5**, Itaya et al. do not teach said second semiconductor substrate including a compound semiconductor layer, which is made of  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  (x is a number from zero to one). Piorek et al. teach the second semiconductor substrate (GaAs) including GaAs/AlAs DBR to obtain resonant cavity structure. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form GaAs/AlAs DBR in Itaya's device, since the GaAs/AlAs DBR can decrease an optical loss, hence increasing light intensity.

Re claim **6**, Itaya et al. do not expressly teach the amorphous layer having a thickness of 1 nm or more. However, Itaya et al. teach the amorphous layer having a thickness of about 10 nm, which is in the range claimed by the applicant (Col.10, lines 58-59). It is an obvious matter of routine experimentation to find the optimal thickness range. Generally, differences in thickness will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such thickness is critical. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the amorphous layer having a thickness of 1 nm or more, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

3. Claim **19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Itaya et al. (US 5,780,873).

Itaya et al. do not expressly teach the amorphous layer having a thickness of 1 nm or more. However, Itaya et al. teach the amorphous layer having a thickness of about 10 nm, which is in the range claimed by the applicant (Col.10, lines 58-59). It is an obvious matter of routine experimentation to find the optimal thickness range. Generally, differences in thickness will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such thickness is critical. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the amorphous layer having a thickness of 1 nm or more, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

***Allowable Subject Matter***

4. Claim 20 is allowed.

Claims 16-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance and indicating allowable subject matter.

Prior art reference, taken along or in combination, do not teach or render obvious that a semiconductor device comprising, first and second semiconductor substrate, both being different in lattice constant and bonded with each other, wherein said first semiconductor substrate is an InP substrate and said second semiconductor substrate

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is a GaAs substrate, and wherein an interface between said first and second semiconductor substrates has a linear current-voltage characteristic, and an amorphous layer made of constituent atoms of said first and second semiconductor substrate is formed at said interface.

### ***Response to Arguments***

5. Applicant's arguments filed January 29, 2004 have been fully considered but they are not persuasive.

Applicant argues that the structure of Itaya et al. is identical with the claimed structure is factually disputed by the disclosure of the present invention. Although the claims are interpreted in light of the specification, limitations from the specification are **not read into the claims**. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that the combination is improper because the office has not met the initial burden of proof that the claimed invention is obvious.

In the art, it is well known using InP for long-wavelength lasers and also taught by Piprek et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use InP material in order to make log-wavelength laser.

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Donghee Kang  
Examiner  
Art Unit 2811

dhk